

The Neutral Polar Wind

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The classical polar wind is an ambipolar outflow of ions from high latitudes along open geomagnetic field lines. The polar wind consists of light thermal ions (H^+ , He^+), and energetic light and heavy ions (H^+ , He^+ , O^+). The characteristics of these ions have been studied quite extensively since the 1960's. In just the last 20 years, however, energetic neutral atoms (ENA) that are produced in charge exchange reactions between the singly ionized polar wind ions and the surrounding neutral atoms have been used as a means to remotely probe plasma populations. Recent estimates for neutral outflow integrated fluxes from the LENA instrument on board the IMAGE spacecraft have shown values of $1-4 \times 10^9 \text{ cm}^{-2} \text{ s}^{-1}$, with a considerable diurnal variation. The theoretical model used in this study is similar to the high-altitude hydrodynamic polar wind model developed at Utah State University, and has been expanded to include the effects of neutral stream particles between the altitudes of 500 km and 9000 km. The model results show a high neutral outflow flux on the order of $10^9 \text{ cm}^{-2} \text{ s}^{-1}$, which would seem to be in agreement with the LENA instrument data.